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Office of Technical Assistance
Executive Office of Environmental Affairs
Commonwealth of Massachusetts

Toxics Use Reduction Case Study

SEPTAGE RECEIVING FACILITY ELIMINATES ODORS

SUMMARY

The Greater Lawrence Sanitary District (GLSD) added an aeration system to its septage treatment tank and eliminated the noxious odors that previously emanated during the treatment process. GLSD's payback on a $77,000 investment came in less than four months and the facility can now accept septage up to the treatment facility capacity of 100,000 gallons per day. The odor problem prevented acceptance of more than 40,000 gallons per day, even when large quantities of odor controlling chemicals were added.

BACKGROUND

The Greater Lawrence Sanitary District (GLSD) is a 52 million gallon per day, activated sludge, wastewater treatment plant that serves approximately 168,000 sewered residents. In addition to piped wastes from homes and businesses, the GLSD provides septage disposal for communities throughout the Merrimack Valley and southern New Hampshire. GLSD Process Control Engineer Richard Fuller found from operating experience that if the septage receiving facility exceeded 40,000 gallons per day (gpd), especially during warm weather months, unacceptable odors escaped into the surrounding community. The odor control chemical, potassium permanganate, for which GSLD was spending $2,000 a month, was effective up to a volume of 40,000 gpd. With a Department of Environmental Protection approved septage receiving capability of 100,000 gpd, the GLSD was losing up to $2,700 a day in septage revenue by observing its self-imposed limit.

TOXICS USE REDUCTION PLANNING

Wastewater treatment plants typically use mechanical stirrers or bubble diffusers to bubble air or oxygen through the liquid waste as part of the treatment process, and this aggravates the release of hydrogen sulfide (H_2S), principal cause of the noxious odors. The use of oxidation chemicals such as potassium permanganate and hydrogen peroxide can successfully control odors, but only for limited quantities of waste. In addition to the added cost, these chemicals also pose risk of fires and explosions. Concentrated solutions of hydrogen peroxide are also highly toxic and a strong irritant.

Economics dictated that GSLD find a way to treat daily septage volumes up to 100,000 gallons without incurring increased chemical costs or generating excessive odors. Early in 1992, OTA recommended that GLSD contact Gary Smith and Dr. James Maskasky of Venturi Aeration. In April 1992, GLSD conducted a pilot test using a Venturi Hydro-Vac®, which clearly demonstrated the unit's ability to oxygenate the septage and eliminate H_2S release prior to discharge to the treatment plant's influent channel. The benefits of having an oxygen saturated septage continued as the septage moved through and over the primary clarifiers, where the atmospheric release of H_2S gas would have occured.

MODIFICATIONS

The GLSD was the first wastewater treatment plant in the country to install a Hydro-Vac® as a means of oxygenating and conditioning septage. On July 6, 1992, the GLSD put into operation three Model A-500 Hydro-

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Vac®'s connected to two Model T4A3-B Gorman-Rupp, 25HP, self-priming, centrifugal pumps capable of pumping 500 gpm each. GLSD personnel installed the system, which including all parts and labor, cost $77,000.

The Hydro-Vac® Wastewater Conditioner, a patented apparatus designed to inject atmospheric oxygen into any liquid, works by pumping wastewater or septage through a high velocity nozzle into a low velocity mixing chamber where the material is mixed with aspirated air and the solids reduced to macroscopic size, releasing the embedded grease and gas bubbles trapped within the organic solids. When enough oxygen is introduced into a liquid to combine with all of the available hydrogen ions produced by the anaerobic digestive process, no hydrogen will be available to form H_2S.

RESULTS

Reductions Achieved: Since installation of the Hydro-Vac® GLSD has been able to increase its septage receiving volume beyond 40,000 gpd without creating offensive odors. The operation of the Hydro-Vac® equipment has also eliminated the need for chemical conditioning to reduce the H_2S odors. In addition, with septage pumping capacity increased from 100 to 500 gpm, all septage receiving can be accomplished on the day shift where more operating and laboratory personnel are available to handle and test the incoming septage. By September 1993, after 15 months of operation, GLSD had experienced no mechanical or process problems with the new method of handling septage.

Hydro-Vac Installation Payback

Month (1992)	Average Septage (gpd)	Daily Septage in Excess of 40,000 gpd	Monthly Revenue from Excess Septage	Monthly Chemical Savings	Monthly Capital Cost Remaining
Jul (23)	57,467	17,467	$18,078	$2,000	($56,922)
Aug (21)	56,552	16,552	$15,642	$2,000	($39,280)
Sep (21)	66,188	26,188	$24,748	$2,000	($12,532)
Oct (21)	70,669	30,669	$28,982	$2,000	+$18,450
Nov (20)	66,598	26,598	$23,938	$2,000	+$44,388
Dec (22)	51,714	11,714	$11,597	$2,000	+$57,985

Economics: The original capital investment of $77,000 was paid back by October 1992 (see table), less than four months after the installation was completed, because of the increased volume of septage received and the $2,000 per month savings on potassium permanganate usage. The figures in parenthesis in the "Month" column of the table are the number of days that septage was received; the facility is open Monday through Friday. The "Monthly Capital Cost Remaining" column shows that by December 1992, based on septage volumes greater than 40,000 gpd, the GLSD had increased their septage revenue by $57,985 based on a charge of $0.045 per gallon of septage received.

This Case Study is one of a series of such documents prepared by the Office of Technical Assistance for Toxics Use Reduction (OTA), a branch of the Massachusetts Executive Office of Environmental Affairs whose mission is to assist industry in reducing the use of toxic chemicals and/or the generation of toxic manufacturing byproducts. OTA's ***non-regulatory*** *services are available at* ***no charge*** *to Massachusetts businesses and institutions that use toxic chemicals. For further information about this or other case studies, or about OTA's technical services, contact:* ***Office of Technical Assistance, Executive Office of Environmental Affairs, Suite 2109, 100 Cambridge Street, Boston, Massachusetts 02202, (617) 727-3260, Fax - (617) 727-3827.***

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